AMERICAN MUSEUM NOVITATES

Number 552 — Published by The American Museum of Natural History New York City — Aug. 17, 1932

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CORYPHODONTS AND UINTATHERES FROM THE MONGOLIAN EXPEDITION OF 1930[1]

By Henry Fairfield Osborn and Walter Granger

The 1930 collection of vertebrate fossils from Mongolia, one of the largest of the five years of exploration in the Gobi, is distinguished by the abundance of material of the shovel-tusked Mastodon *Platybelodon* and of three different kinds of amblypods, formerly rare in our Mongolian collections. Of this latter order three distinct groups are represented, two belonging to the family Coryphodontidæ previously known from Mongolia, and one belonging to the Uintatheriidæ, the first known occurrence of this family outside of North America with the exception of *Prodinoceras* from the Gashato Paleocene of the western Gobi.

Of the Coryphodontidæ there are additional specimens of the genus *Eudinoceras*, Osborn, 1924, from the Upper Eocene Irdin Manha beds, and a single specimen, a beautifully preserved skull of a distinctly new genus, *Hypercoryphodon*, Osborn and Granger, 1932, from the mid-Oligocene Houldjin Gravels; this new form is presumably the last representative of the order Amblypoda which was formerly supposed to have become extinct in Upper Eocene times.

The coryphodontids accordingly include:

Eudinoceras: Upper Eocene, Irdin Manha horizon, brachycephalic.
Hypercoryphodon: Mid-Oligocene, Houldjin Gravels, extremely dolichocephalic.

The Uintatheriidæ are represented in the Upper Eocene Irdin Manha formation by the new form *Gobiatherium*, the name signifying "the wild beast of the Gobi" in contrast to its distant American relative, *Uintatherium*, "the wild beast of the Uinta Mountains."

List of Materials

1. From the Houldjin Gravels—Oligocene.

Hypercoryphodon thomsoni, gen. et sp. nov.

A. M. 26384. Complete skull.

2. From the Irdin Manha beds—Upper Eocene

Eudinoceras mongoliensis

A. M. 26611. Lower jaws with nearly complete dentition.

[1]Publications of the Asiatic Expeditions of The American Museum of Natural History. Contribution No. 113.

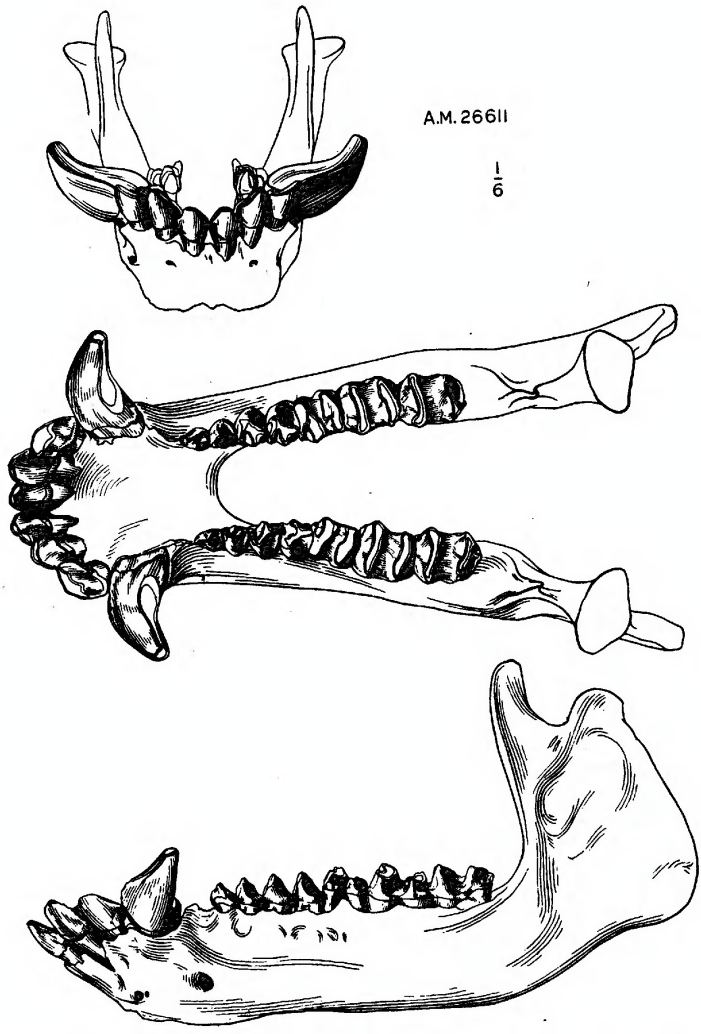

Fig. 1. *?Eudinoceras mongoliensis.* Anterior, superior and left lateral views of mandible. A. M. 26611, from the Irdin Manha beds (type horizon), Iren Dabasu region. One-sixth natural size.

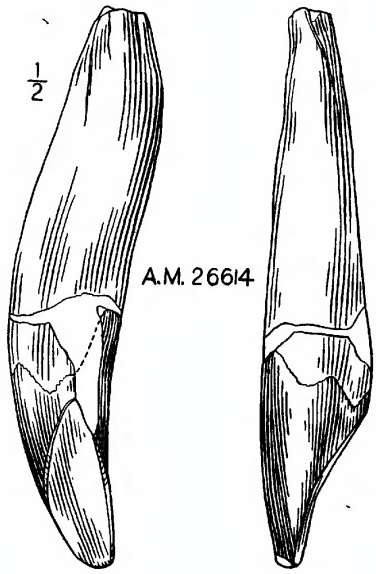

Fig. 2. *?Eudinoceras mongoliensis.* Right upper canine, probably of a female skull. A. M. 26614, from the Irdin Manha beds (type horizon), Iren Dabasu region. Found in association with fragmentary M^3 shown in Figure 3. Inner (left) and anterior (right) aspects. One-half natural size.

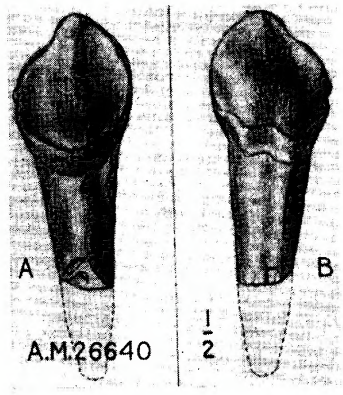

Fig. 3. *?Eudinoceras mongoliensis.* Portion of a last right upper molar. A. M. 26614 from the Irdin Manha beds (type horizon), Iren Dabasu region. Found in association with canine shown in Figure 2. One-half natural size.

Fig. 4. *?Eudinoceras mongoliensis.* Incisor tooth. Lingual (A) and labial (B) aspects. A. M. 26640. Irdin Manha beds (type horizon), Iren Dabasu region. One-half natural size.

List of Materials (Continued)

Eudinoceras mongoliensis (*Continued*)

A. M. 26612. Lower jaw with P_2-M_3.
A. M. 26613. Lower jaw with P_2-M_3.
A. M. 26614. Upper canines, incisor, and fragments of upper molars.
A. M. 26638. P^3.
A. M. 26639. Fragmentary skull with roots of molars and premolars.
A. M. 26640. Incisor tooth.

Gobiatherium mirificum, gen. et sp. nov.

A. M. 26615. Lower jaw fragment with M_{2-3}.
A. M. 26616. Anterior portion of lower jaws with P_2-M_3.
A. M. 26617. Maxilla with P^2-M^3.
A. M. 26618. Front of skull, juvenile, P^2-M^2.
A. M. 26619. Palate and lower jaw—association uncertain.
A. M. 26620. Back of skull with P^4-M^3.
A. M. 26621. Lower jaw with P_3-M_3.
A. M. 26622. Lower jaw, juvenile, with dM_{3-4} and M_1.
A. M. 26623. Right half of skull with P^3-M^3.
A. M. 26624. Nearly perfect skull with P^2-M^3.
A. M. 26625. Nearly complete skull with P^2-M^3.
A. M. 26637. Skull, teeth badly worn or absent.
A. M. 26627. Two incisors and one molar—unassociated.
A. M. 26629. Top of skull—no teeth.
A. M. 26630. Lower jaws with P_2-M_3.
A. M. 26631. Anterior portion of skull with vestigial canine.
A. M. 26632. Lower jaw with P_2-M_3.
A. M. 26633. Lower jaw with P_2-M_3.
A. M. 26634. Naso-frontal region of skull.
A. M. 26635. Lower jaw with M_3.
A. M. 26636. Humerus.
A. M. 26626. Femur.
A. M. 26628. Astragalus, four metapodials and one rib—unassociated.

Family: Coryphodontidæ

Eudinoceras, Osborn, 1924

When first discovered (Osborn, 1924.626, p. 2),[1] *Eudinoceras mongoliensis*, based on two isolated fourth superior premolar teeth (*op. cit.*, p. 4), this animal was regarded as a Mongolian representative of the American genus *Dinoceras*. Subsequent discovery enabled Osborn and Granger[2] to correct this error and place *Eudinoceras mongoliensis* as a relative of *Coryphodon* chiefly distinguished by the rudimentary development of the protocones on the superior premolars in contrast to the large crescentic protocones characteristic of the true genus *Coryphodon*. At the same time two species were characterized, namely:

Eudinoceras mongoliensis (Osborn, 1924), Irdin Manha formation, *Protitanotherium* life zone of the eastern Gobi.

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[1]Osborn, H. F., 1924.626. *Eudinoceras*, Upper Eocene Amblypod of Mongolia. Amer. Mus. Novitates, No. 145, Nov. 10, 1924, pp. 1–5, text figs. 1, 2.

[2]Osborn, H. F., and W. Granger, 1931.845. Coryphodonts of Mongolia, *Eudinoceras mongoliensis* Osborn, *E. kholobolchiensis* sp. nov. Amer. Mus. Novitates, No. 459, March 4, 1931, pp. 1–13, text figs. 1–11.

Eudinoceras kholobolchiensis (Osborn and Granger, 1931)[1], Kholobolchi formation, *Eudinoceras kholobolchiensis* life zone of the western Gobi.

GENERIC AND SPECIFIC CHARACTERS.—Cranium (*E. kholobolchiensis*) relatively broad (360 mm.) in relation to its total length (516 mm.); full eutherian dentition above and below. Incisors and canines similar to those in *Coryphodon*; maxillary rostrum broadened. Premolars, four superior and inferior, protocones rudimentary (*E. mongoliensis*), protocones larger (*E. kholobolchiensis*). Superior molars readily distinguished from those of *Coryphodon testis* by progressive lophodonty of the nearly parallel protoloph and metaloph, in wide contrast to the crescentic disposition of the metaloph in all species of *Coryphodon*, e.g., genotypic species *C. eocænus* Owen, or the American species *C. testis*.

The authors concluded: "In brief, the premolars and molars of *Eudinoceras* represent a specific and generic line of evolution independent from that of the American coryphodonts, but, as with the cranium, the premolars indicate that this phylum is much nearer *Coryphodon* than *Uintatherium* (=*Dinoceras*)."[2]

LOWER DENTITION.—From the Irdin Manha beds, about twenty miles west of the type locality of *Eudinoceras mongoliensis* and in the same horizon, the 1930 Expedition obtained the first specimens of lower jaws of this form. Of the three specimens found, two are single rami with cheek teeth present, while the third is a splendid pair of lower jaws (Fig. 1) exhibiting the full dentition. The type of *E. mongoliensis* is an upper premolar, and upper and lower teeth of this form have never been found in association, but there seems little doubt that these three jaws pertain to this genus and presumably to the genotypic species.

There is a remarkable similarity between these lower jaws and those of *Coryphodon*, both in the general outlines of the jaws and in the teeth. The chief differences are that in *Eudinoceras* the lophs of the molars are not connected by a transverse crest, the premolars show more antero-posterior compression and the canines have an unusual outward flare.

HYPERCORYPHODON, gen. nov.

This genus is based upon the new genotypic species *Hypercoryphodon thomsoni* as described below:

Hypercoryphodon thomsoni, sp. nov.

TYPE.—A. M. 26384. A splendidly preserved skull with all cheek teeth and alveoli of incisors and canines.

HORIZON AND LOCALITY.—Houldjin Gravels, mid-Oligocene. Twenty-five miles southwest of Iren Dabasu, Inner Mongolia. Found and collected by Chinese Assistant Chih. Central Asiatic Expedition, 1930.

GENERIC AND SPECIFIC CHARACTERS.—Dentition 3. 1. 4. 3.; full eutherian formula. I^1 the largest of the incisor series, I^{2-3} of equal size and slightly smaller than I^1, canine larger than I^1 but not enlarged as in *Coryphodon* or *Eudinoceras*. The type skull of *Hypercoryphodon* may possibly be that of a female, in which case the canines

[1]Osborn and Granger, 1931, *op. cit.*, p. 4, fig. 2.
[2]Idem, p. 7.

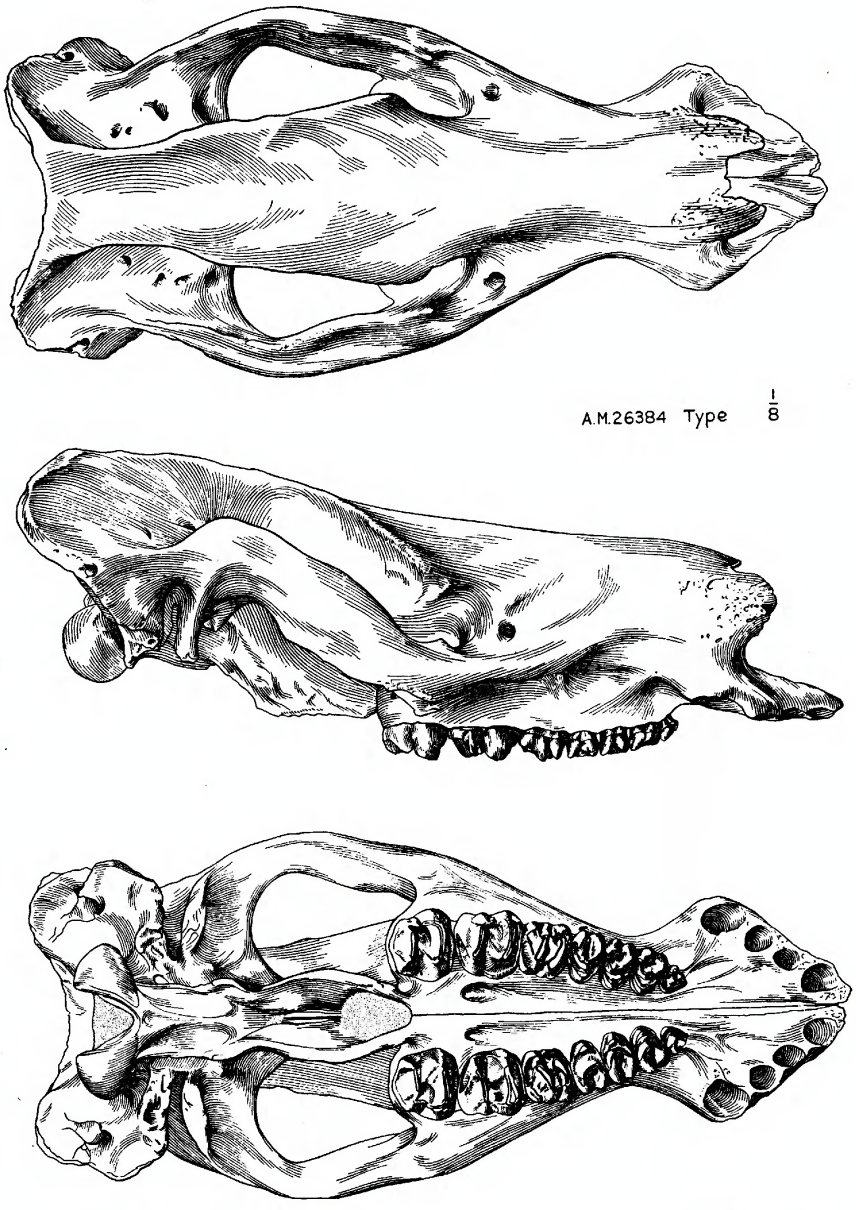

Fig. 5. *Hypercoryphodon thomsoni*, gen. et sp. nov. Type, A. M. 26384. Superior, right lateral and palatal views of skull. One-eighth natural size.

would naturally be much reduced. Cheek teeth of general coryphodont type. Premolars with outer crests much more flattened and less V-shaped than in *Eudinoceras*, in which respect they approach more nearly *Coryphodon*. Premolar protocones strongly developed and more crescentic than in *Eudinoceras*. A strong inner cingulum on P_2-P_4. P^1 about half the transverse diameter of P^2. P^{2-4} subequal in size, increasing slightly in size toward the molars. Molars quadrate with anterior and posterior crests parallel to each other, the anterior crest being somewhat the longer. Crests on M^3 transverse, those on M^{1-2} directed backward toward the median line. On the outer face of the molars there is a strong median rounded cusp which is connected with the posterior crest. Cingulum on inner border of M^1 broken, on M^2 continuous but weak, absent on M^3. M^1 smallest of the series, M^{2-3} about equal in size.

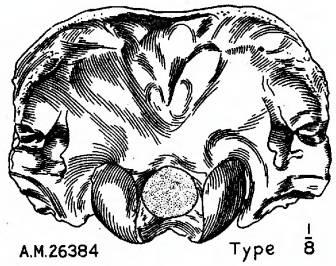

Fig. 6. *Hypercoryphodon thomsoni*, gen. et sp. nov. Type, A. M. 26384. Occipital view of skull. One-eighth natural size.

Skull much elongated, in which respect it differs from any other known coryphodont. The sagittal crest very moderately flattened and broadened. Top of skull without swellings or horn bosses; the median profile, from the lambdoidal ridge to the nasal, is nearly straight. Maxillo-premaxillary region moderately expanded.

Supplementing the above summary of generic and specific characters are the rugosities on either face of the superior maxilla, indicating either a cartilaginous exostosis or the attachment of muscles for a large flexible upper lip. The highly distinctive character of the cranium is its elongation (800 mm.) or dolichocephaly, affording a length, breadth and cranial index of 45 in contrast to the length, breadth and cranial index of 70 in *Eudinoceras kholobolchiensis*. The second highly distinctive feature is the extreme *lophodonty* or perfection of the transverse crests of the superior molars, comparable to that attained in all hyper-lophodont ungulates, and widely dissimilar to the lopho-selenodont molars of *Coryphodon*; this is a progressive stage beyond the lophodonty of *Eudinoceras*. A double, clear distinction from *Eudinoceras* is afforded both by the extreme dolichocephaly and by the bicrescentic structure of the premolar teeth which surprisingly resemble those of *Coryphodon testis*.

MEASUREMENTS OF *Hypercoryphodon thomsoni*, TYPE

Greatest length, premaxillæ to lambdoidal ridge	800 mm.
Greatest width across middle of arches	362
Width across lambdoidal ridge on level with condyle	310
Width across postorbital processes	190
Width of crest at narrowest point (posterior)	95
Width across canine alveoli	225

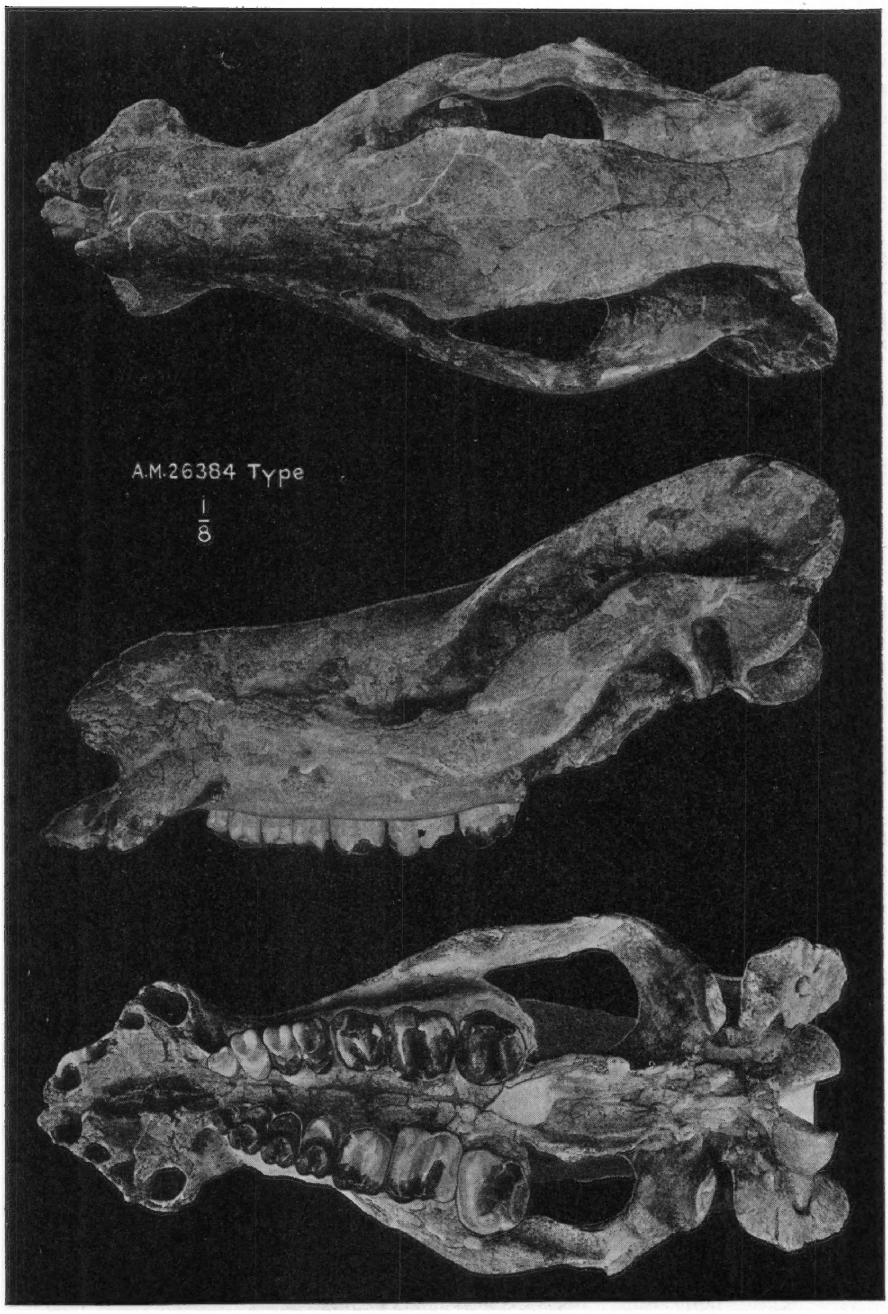

Fig. 7. *Hypercoryphodon thomsoni*, gen. et sp. nov. Type, A. M. 26384. Superior, left lateral and palatal views of skull. One-eighth natural size.

MEASUREMENTS OF *Hypercoryphodon thomsoni*, TYPE (Continued)

Depth of skull at M^2	250 mm.
P^1-M^3	311
P^1-P^4	128
M^1-M^3	183
P^1 ant.-post.	25.5
P^1 transverse	28
P^2 ant.-post.	32
P^2 transverse	51.2
P^4 ant.-post.	32
P^4 transverse	58
M^1 ant.-post.	52
M^1 transverse	62
M^2 ant.-post.	65
M^2 transverse	73 (estimated)
M^3 ant.-post.	64.5
M^3 transverse	76
Canine alveolus (diagonal)	45

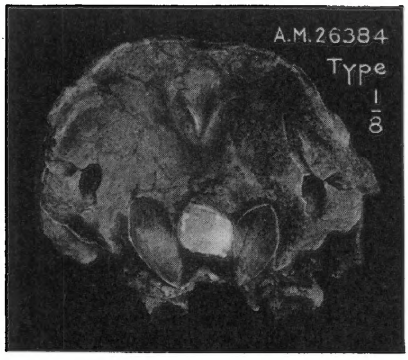

Fig. 8. *Hypercoryphodon thomsoni*, gen. et sp. nov. Type, A. M. 26384. Occipital view of skull. One-eighth natural size.

Fig. 9. *Hypercoryphodon thomsoni*, gen. et sp. nov. Type, A. M. 26384. Anterior-oblique view of top of skull. One-eighth natural size.

Family: UINTATHERIIDÆ

GOBIATHERIUM, gen. nov.

This new genus is based upon the genotypic species, *Gobiatherium mirificum*, names indicating that it may be considered one of the most outstanding of the many surprising discoveries of the Central Asiatic Expeditions.

Gobiatherium mirificum, sp. nov.

TYPE.—A. M. 26624, a complete and nearly perfect skull.

PARATYPE.—A. M. 26630, a nearly complete pair of lower jaws, lacking the incisors.

HORIZON AND LOCALITY.—From the Upper Eocene Irdin Manha formation. Twenty-five miles southwest from Iren Dabasu, Inner Mongolia. Found by Dr. H. C. Chang.

GENERIC AND SPECIFIC CHARACTERS.—Dentition $\frac{0}{3}\cdot\frac{0}{1}\cdot\frac{3}{3}\cdot\frac{3}{3}$. Molars and premolars similar to those of *Dinoceras*. Lower incisors bilobed. Lower canines probably like the incisors. Skull elongate and rather low and entirely lacking in the median and posterior horns of the American uintatheres. Sagittal region broad and flat except for a slight swelling extending across the skull about half-way between the orbits and the occiput. Zygomatic arches very broad, flaring out abruptly in the region of the glenoid facet. Nasal region either highly arched medially or divided into small upturned paired horns, probably a sex differentiation. In the two specimens with arched nasals, presumed to be males, there is a curved median bony septum connecting the nasals with the tips of the premaxillæ, and in one of these, see Fig. 11, the nasals are surmounted by a pair of bony excrescences. Lower jaw broadly spatulate in the symphyseal region and shallow and slender in the shaft, ascending ramus higher than in *Dinoceras*, no suggestion of the flange which is observed in American uintatheres and is correlated with an enlarged flattened upper canine. Humerus and femur similar in structure and proportions to *Dinoceras* but metapodials more elongate and slender.

MEASUREMENTS OF TYPE SKULL OF *Gobiatherium mirificum*, A. M. 26624

Greatest length, premaxillæ to condyles	680 mm.
Greatest width, across zygomatic arch	400
Depth of skull in nasal region	170
Depth of skull above P^2	80
Width of top of skull at postorbital constriction	135
P^2-M^3	153
P^2-P^4	62
M^1-M^3	91
P^2 ant.-post.	20
P^2 transverse	20
P^3 ant.-post.	20
P^3 transverse	25
P^4 ant.-post.	21
P^4 transverse	27

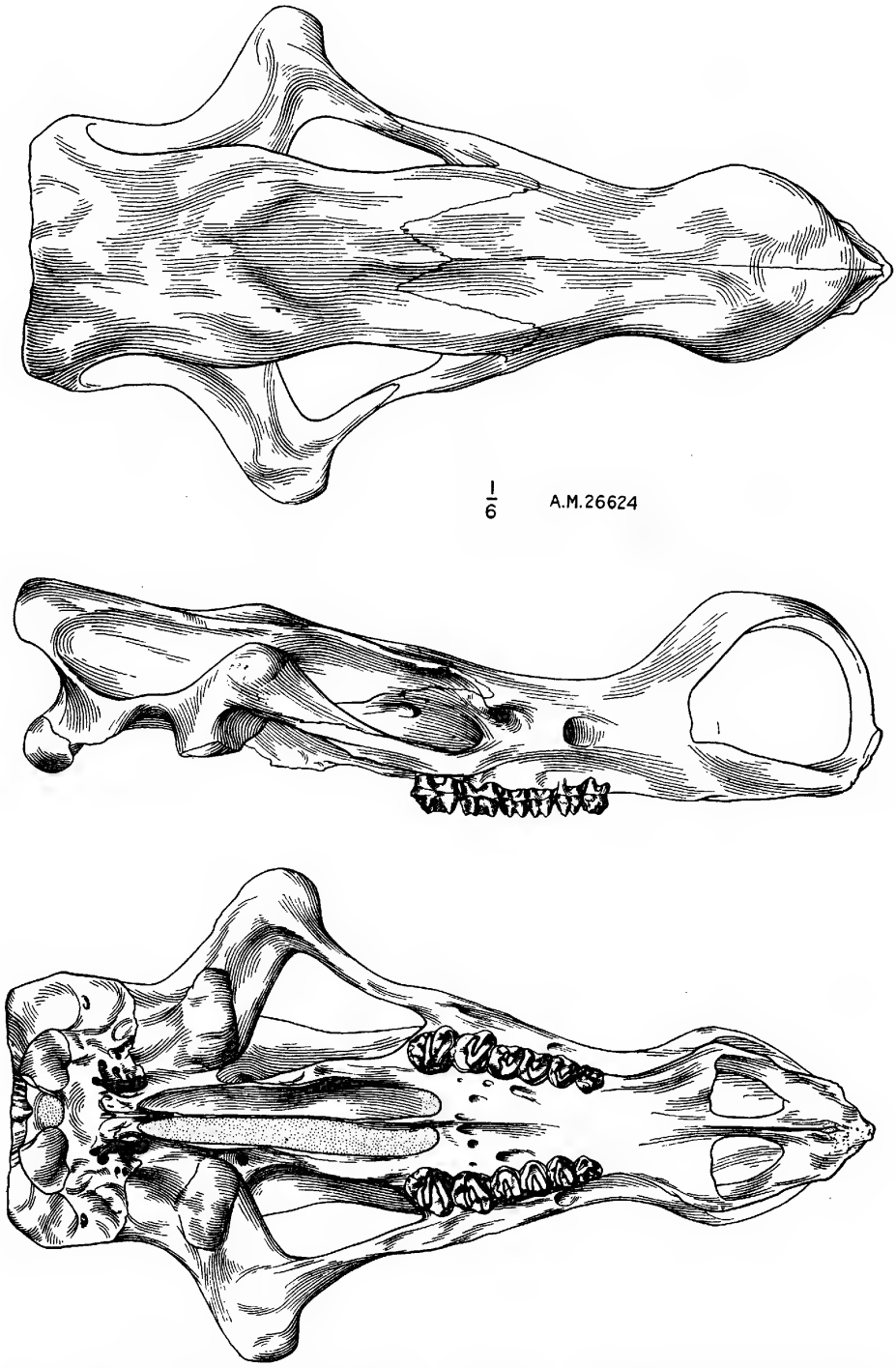

Fig. 10. *Gobiatherium mirificum*, gen. et sp. nov. Type, A. M. 26624. Superior, right lateral and palatal views of skull. One-sixth natural size.

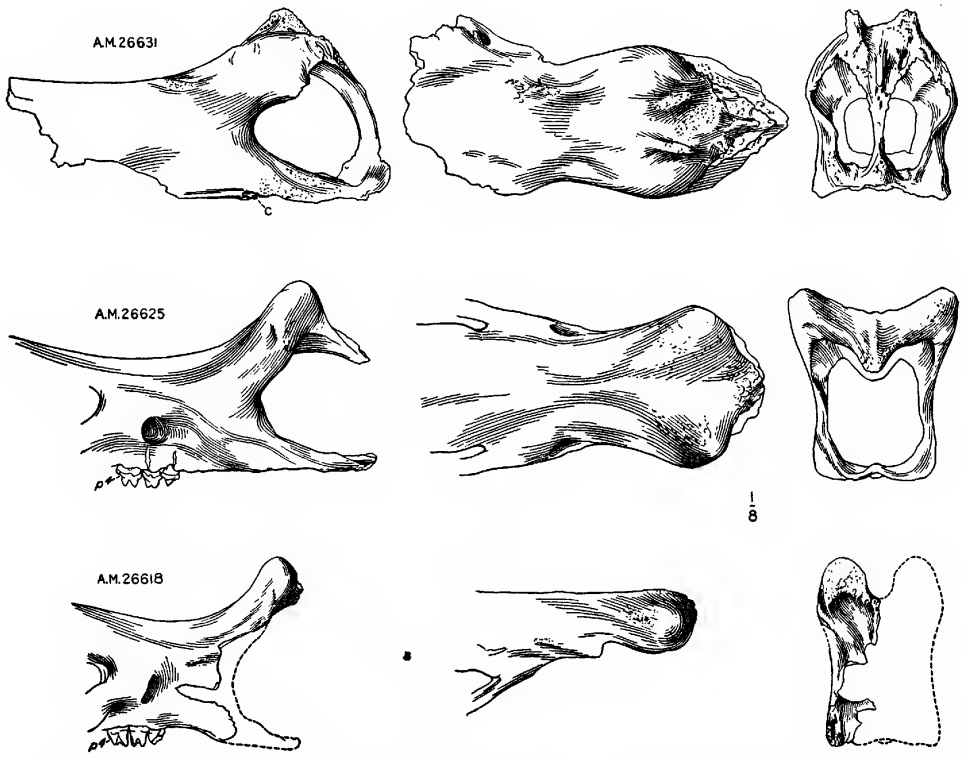

Fig. 11. *Gobiatherium mirificum*, gen. et sp. nov. Anterior portions of three skulls; side, top and front views to show variation in the structure of the nasals. The two uppermost (A. M. 26631 and A. M. 26625) are adults; the bottom one (A. M. 26618) is young with the M^3 unerupted. Note the vestigial canine in the side view of A. M. 26631. One-eighth natural size.

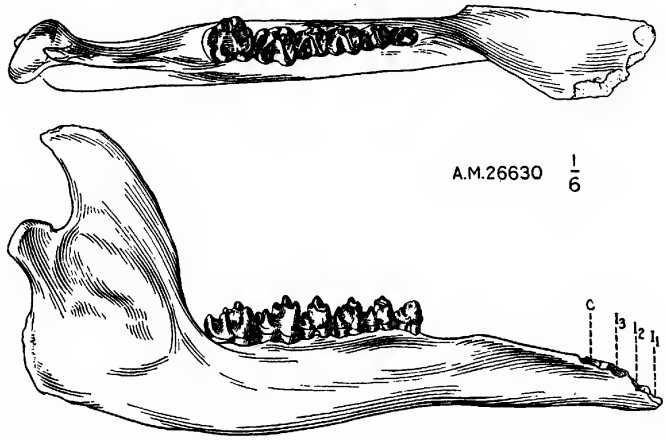

Fig. 12. *Gobiatherium mirificum*, gen. et sp. nov. Right ramus of the lower jaws. External and crown views. A. M. 26630. One-sixth natural size. The anterior alveolar border is restored from the left side.

MEASUREMENTS OF TYPE SKULL OF *Gobiatherium mirificum*, A. M. 26624
(Continued)

M^1 ant.-post.	23 mm.
M^1 transverse	25
M^2 ant.-post.	30
M^2 transverse	30
M^3 ant.-post.	35
M^3 transverse	32

MEASUREMENTS OF PARATYPE LOWER JAW OF *Gobiatherium mirificum*, A. M. 26630

Greatest length	480 mm.
Depth of ramus at M_1	67
P_2-M_3	163
P_2 ant.-post.	20
P_2 transverse	12
P_3 ant.-post.	23
P_3 transverse	18
P_4 ant.-post.	23
P_4 transverse	21
M_1 ant.-post.	28
M_1 transverse	23
M_2 ant.-post.	31
M_2 transverse	29
M_3 ant.-post.	39
M_3 transverse	36

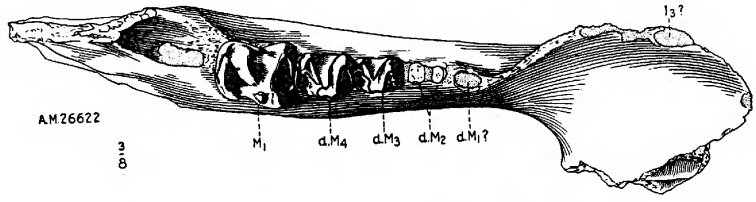

Fig. 13. *Gobiatherium mirificum*, gen. et sp. nov. Left ramus of lower jaw, crown view. Young individual with third and fourth milk molars and first true molar. A. M. 26622. Three-eighths natural size.

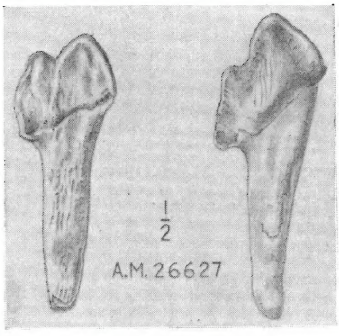

Fig. 14. *Gobiatherium mirificum*, gen. et sp. nov. Two left lower incisor teeth, lingual views. A. M. 26627 (association uncertain). One-half natural size. These teeth were found loose in the deposit which yielded several skulls and jaws of this species.

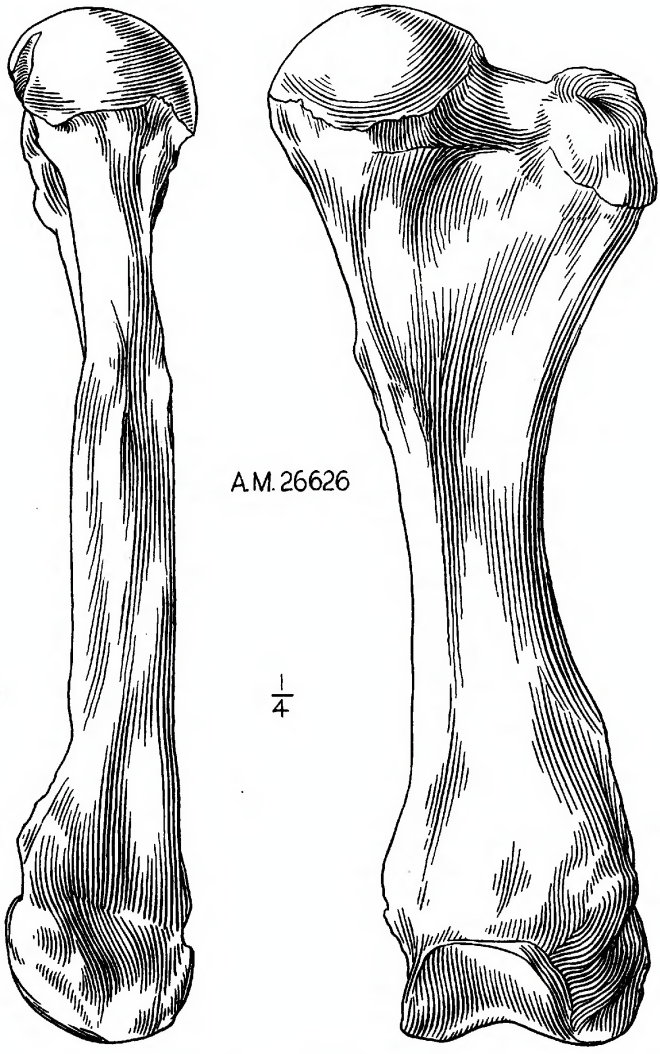

Fig. 15. *Gobiatherium mirificum*, gen. et sp. nov. Left femur, anterior and inner views. A. M. 26626. One-fourth natural size.

As shown in the superb genotypic cranium, this new genus from the Old World conserves the microdont, triangular, and fundamentally tritubercular superior and inferior dentition characteristic of the American uintatheres, including both *Dinoceras* and *Loxolophodon*. This

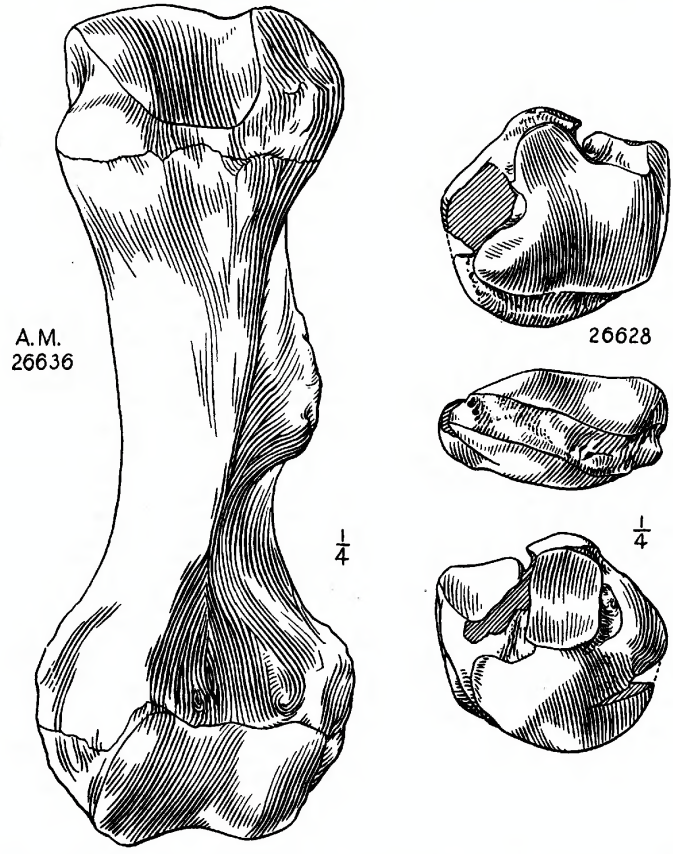

Fig. 16. *Gobiatherium mirificum*, gen. et sp. nov. Left humerus, anterior view. A. M. 26636. One-fourth natural size.

Fig. 17. *Gobiatherium mirificum*, gen. et sp. nov. Left astragalus, proximal, anterior and distal views. A. M. 26628. One-fourth natural size.

dentition leaves us in no doubt that this type should be embraced within the family UINTATHERIIDÆ. On the other hand, if the dentition were unknown, there are few, if any, characters of the cranium suggestive of relationship either to *Dinoceras* or *Loxolophodon*, excepting perhaps the extreme dolichocephaly indicated in the equally elongate cranial and

facial moieties. Two characters are surprising: the wide transverse extension of the zygomatic arches, reminding us of similar prominences in *Entelodon*, and the relatively low, flat, backwardly extended temporal fossa and occiput doubtless correlated with the feeble development of the muscles of mastication in adaptation to the relatively long and slender mandible. The absence of the downward flange in the slender anterior rostrum of the mandible may possibly be a sexual character, because in the female uintatheres with small tusks, the mandibular flange is much less prominent than in the males with their great tusks. However, in the seven specimens present there is no trace of a flange.

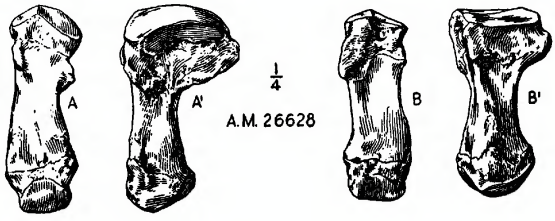

Fig. 18. *Gobiatherium mirificum*, gen. et sp. nov. A and A'—third metacarpal of the left foot, anterior and ulnar views. B and B'—second metacarpal of the right foot, anterior and radial views. A. M. 26628. One-fourth natural size.

Of all distinctive features, however, the extremely elevated and arched nasals, rising above the level of the cranial vertex and supported by a median fully ossified septum resting on the slender premaxillaries, are not only surprising but unique.

Similar to the typical UINTATHERIIDÆ is the edentulous premaxillary, and in great contrast is the absence of canines, with the exception of one specimen which exhibits an extremely vestigial canine on one side only.